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PATENT ABSTRACTS OF JAPAN

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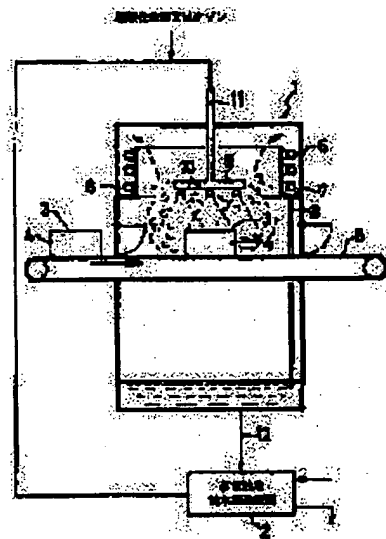
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(54) CLEANING OF SUBSTRATE

(57) Abstract:

PURPOSE: To provide the method for cleaning a substrate by which an operation of the device can be easily monitored and the device can be easily maintained due to a simple structure of the device and the manufacturing cost of the device can be reduced due to a small quantity of material of construction of the device.

CONSTITUTION: Pure water which is heated to temperatures higher than a boiling point corresponding to the pressure inside a substrate cleaner 1 is pressurized to the saturated vapor pressure corresponding to the temperature of the pure water or above and is blown off through a spray nozzle 10 installed inside the cleaner 1. By this treatment, a part of the pure water is evaporated by itself to produce a mixed fluid of the pure water and steam. The mixed fluid is caused to crash against a substrate 3 to clean up the substrate 3.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the washing method of various substrates, such as a glass substrate for liquid crystal, and a semiconductor substrate, and the substrate washing method that it was suitable for washing of the substrate of trench type structure in more detail.

[0002] In this specification, ultrapure water shall be included in "pure water."

[0003]

[Description of the Prior Art] Conventionally, the washing method by pure water was adopted as the substrate washing methods, such as a glass substrate for liquid crystal, and a semiconductor substrate. However, detailed-ization of a semiconductor substrate progressed with high integration of a semiconductor, it is the trench type with which the trench (slot) was dug in the substrate, and moreover the structure of a high aspect ratio where a trench was deep was increasing, and when the substrate of the high trench type structure which is such an aspect ratio was washed, by the washing method by conventional pure water, sufficient cleaning effect was not obtained that pure water cannot permeate easily in the trench of a substrate.

[0004] For this reason, the substrate washing method equipped with the means which switches a means wash with the steam which heated pure water to JP,1-189127,A and was generated in it also in the substrate of the high trench type structure of an aspect ratio as that from which a high cleaning effect is obtained, a means wash with pure water, the means that is made to generate an ultrasonic wave and heightens a cleaning effect in case pure water washes, and washing by the steam and washing by pure water is indicated.

[0005]

[Problem(s) to be Solved by the Invention] Although it has the advantage that a steam permeates in the trench of a substrate, raises the surface wettability by pure water, and heightens the cleaning effect in a trench, by the above-mentioned substrate washing method since a steam can permeate a detailed portion while generating an ultrasonic wave and heightening a cleaning effect Since various kinds of meanses were needed, the composition of equipment became complicated, and since there was much material of construction of equipment, there was a problem that the manufacturing cost of equipment cost dearly, troublesome [operation surveillance and a maintenance].

[0006] Since the purpose of this invention is simple for the composition of equipment, it is to offer the substrate washing method that the manufacturing cost of equipment can be reduced since there is little material of construction of equipment, easily [operation surveillance and a maintenance].

[0007]

[Means for Solving the Problem] The substrate washing method by this invention is characterized by blowing off from the spray nozzle which pressurized the pure water made by the elevated temperature beyond the maximum vapor tension corresponding to the temperature of pure water, and was prepared in the washing station from the boiling point corresponding to the pressure in a substrate washing station, evaporating some pure water, making the interflow object of pure water and a steam collide with a

substrate, and washing a substrate.

[0008]

[Function] If it blows off from the spray nozzle which pressurized the pure water made by the elevated temperature beyond the maximum vapor tension corresponding to the temperature of pure water, and was prepared in the washing station from the boiling point corresponding to the pressure in a substrate washing station, since the pressure of pure water falls, the part will carry out self-evaporation and it will become a steam, and the interflow object of pure water and a steam will be made, this interflow object will collide with a substrate, and a substrate will be washed. Therefore, a steam permeates in a trench, the surface wettability by pure water is raised, and washing by pure water is performed simultaneously.

[0009] Moreover, a lot of fine air bubbles generated by self-evaporation on the substrate are crushed when an interflow object collides with a substrate, and a cleaning effect is heightened by the big pressure generated at this time. That is, the cavitation operation in the case of ultrasonic cleaning and the same operation are obtained.

[0010]

[Example] The example of this invention is explained with reference to a drawing below.

[0011] it is shown in drawing 1 -- as -- substrate washing station (1) substrate (3) washed Attached mount (4) Conveyer (5) to carry It is a washing station (1) about the pressurized pure water. The water pipe supplied from the upper part inside (11), distributed level cylinder-like pipe (9) with which the ends toward which the pure water sent with the water pipe (11) is made to shunt horizontally were closed Distributed pipe (9) Two or more spray nozzles prepared in the undersurface (10), washing station (1) Two or more cooling pipes (6) prepared in the up inside of a side attachment wall cooling pipe (6) Condensation reservoir (7) in which the condensate condensed by the outside surface is accumulated It is a washing station (1) about a condensate. The downcomer (8) which makes a bottom flow down, and the condensate and substrate (3) which flowed down at the bottom It has the pure water recovery pipe (12) which sends the drainage after washing to a multiplex utility water purifying apparatus (2).

[0012] Below, the case where the semiconductor substrate of trench type structure is washed is made into an example, and the operation is explained.

[0013] The pure water for washing is a multiplex utility water purifying apparatus (2). It is manufactured and has the temperature of 105 degrees C, and the property of specific resistance 18 M omega-cm. Washing station (1) Inside is operated with atmospheric pressure, and pure water is pressurized beyond 105-degree C maximum vapor tension (about 120.8 kPa(s)) so that self-evaporation may not be carried out within a water pipe (11) and a distributed pipe (9).

[0014] When the pure water sent in the state of pressurization is blown off from a spray nozzle (10), since the pressure of pure water descends near the atmospheric pressure, some pure water carries out self-evaporation from the inside of the front face of a pure water particle, and a particle, it serves as a steam, simultaneously with passage, the interflow object of pure water and a steam can do a spray nozzle (10), and this interflow object is a substrate (3). It collides and is a substrate (3). It washes.

[0015] The steam by which the spray was carried out is a substrate (3). It permeates in the trench of micro processing of a field, the surface wettability by pure water is raised, and the cleaning effect in a trench is heightened.

[0016] Moreover, volume expansion energy in case some pure water carries out self-evaporation makes the collision force to the substrate (3) of pure water increase, and it is a substrate (3). The cleaning effect of contaminations, such as an adhering particle, is heightened.

[0017] Furthermore, it is shut up in the state of air bubbles within a particle, and some steams generated within the pure water particle are substrates (3). It collides, air bubbles break simultaneously with a collision, it breaks at this time, and a cleaning effect is heightened by the force.

[0018] A lot of fine air bubbles generated by self-evaporation on the substrate are crushed when an interflow object collides with a substrate, and a cleaning effect is heightened by the big pressure generated at this time further again. That is, the cavitation operation in the case of ultrasonic cleaning and the same operation are obtained.

[0019] Moreover, some steams are substrates (3) at the time of destruction of air bubbles. The surface

wettability which permeated in the trench of a field and was raised with the steam by which the spray was carried out is raised further.

[0020] Substrate (3) The washing drainage which fell mostly among the interflow objects which washed the field to 100 degrees C of the boiling point at the time of atmospheric pressure is a washing station (1). It passes along the pure water recovery pipe (12) formed in the bottom, and is a multiplex utility water purifying apparatus (2). It is returned and reused. On the other hand, a steam is a cooling pipe (6) to which cooling water flows the inside of a pipe. Condensing by the outside surface, this condensate is a condensation reservoir (7). It passes along a downcomer (8) and is a washing station (1). It flows down at the bottom and is a washing station (1) like washing drainage. It passes along the pure water recovery pipe (12) formed in the bottom, and is a multiplex utility water purifying apparatus (2). It is returned and reused.

[0021] At the above-mentioned example, it is a washing station (1). An inner pressure is a washing station (1), although operated with atmospheric pressure. Even if an inner pressure is higher than atmospheric pressure, it may be low. By any case, it is a distributed pipe (9). The temperature of inner pure water is a washing station (1). It is higher than the boiling point of the water corresponding to the inner operating pressure force, and they are a water pipe (11) and a distributed pipe (9) till just before a spray nozzle (10). The pressure of pure water should just be pressurized beyond the maximum vapor tension corresponding to the temperature of pure water so that pure water may not carry out self-evaporation inside.

[0022] Furthermore, in order to heighten a cleaning effect, before pure water blows off from a spray nozzle (10), a hydrogen peroxide or ozone may be poured in.

[0023]

[Effect of the Invention] Since according to the substrate washing method by this invention a steam permeates in the trench of a substrate, raise the surface wettability by pure water, washing by pure water is performed simultaneously, still a lot of air bubbles are crushed and the cavitation operation in the case of ultrasonic cleaning and the same operation are obtained, in case pure water washes, the means which switches washing by the means and the steam which are made to generate an ultrasonic wave and heighten a cleaning effect, and washing by pure water is unnecessary.

[0024] Therefore, easily [operation surveillance and a maintenance], since the composition of equipment is easy, since there is little material of construction of equipment, the manufacturing cost of equipment can be reduced.

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CLAIMS

(57) [Claim(s)]

[Claim 1] The substrate washing method characterized by blowing off from the spray nozzle which pressurized the pure water made by the elevated temperature beyond the maximum vapor tension corresponding to the temperature of pure water, and was prepared in the washing station from the boiling point corresponding to the pressure in a substrate washing station, evaporating some pure water, making the interflow object of pure water and a steam collide with a substrate, and washing a substrate.

[Translation done.]